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SPECIAL ARTICLES

RECENT DISCUSSIONS OF THE ORIGIN OF
GYMNOSPERMS¹

THE discovery a few years ago by Professors Scott and Oliver² of the relation of the Paleozoic seeds known as *Lagenostoma* to the stems of *Lyginodendron*, in itself perhaps the most important contribution of paleobotany to botany that has ever been made, appears to have inaugurated an era of speculation in England during which the ferns seem to be in danger of almost total elimination, if one may judge from some of these recent contributions to the literature, Professor Seward even bringing forward the Lycopodiales as the ancestors of the Araucarieæ and necessarily the balance of the Coniferales as well, as if to relieve the dwindling Paleozoic Filicales from the burden of standing godfather to too many modern lines of descent.

While yielding full appreciation of the remarkable discoveries so admirably worked out in connection with the Pteridosperms, it seems to the writer that the present is an opportune time for recalling that threadbare maxim 'to make haste slowly,' for while we observe a laudable conservatism when it comes to a mere 'impression,' a 'structure' seems to be a peg on which it becomes immediately necessary to hang a theory.

Aphlebiæ may indicate pteridospermous affinity as Professor Oliver has intimated, and exannulate sporangia may also suggest, to

¹ Oliver, F. W., 'The Seed, a Chapter in Evolution,' Pres. address to Botanical Section, Brit. Assn. Adv. Sci., York, 1906. Arber, E. A. Newell, 'On the Past History of the Ferns,' *Ann. of Bot.*, Vol. XX., pp. 215-232, July, 1906. 'The Origin of Gymnosperms at the Linnean Society' (a discussion by Oliver, Scott, Arber, Seward, Weiss, Worsdell and others), *New Phytologist*, Vol. V., pp. 68-76, 141-148, 1906. Seward, A. C., and Ford, Sibille, O., 'The Araucarieæ, Recent and Extinct,' *Phil. Trans. Royal Soc. London*, B, Vol. 198, pp. 305-411, 1906.

² Scott, D. H., and Oliver, F. W., 'On the Structure of the Paleozoic Seed *Lagenostoma Lomaxi*, with a Statement of the Evidence upon which it is Referred to *Lyginodendron*,' *Phil. Trans. Royal Soc. London*, B, Vol. 197, pp. 193-247, 1904.

some, that the Eusporangiatae ferns are absent in the Paleozoic, although this latter view is a rather sweeping generalization from Mr. Kidston's *Crossotheca Hæninghausi* and Miss Benson's *Telangium Scotti*. One is tempted to inquire whence came these structures? Were they evolved among the Pteridospermae? or rather do they not furnish another illustration of what Mr. Worsdell styles the grain of truth which underlies Professor Seward's discussion, that "All groups of plants shewed the same organs because they had inherited them from common ancestors." While the presence of *Aphlebia*-like organs and exannulate sporangia may eventually be found to characterize the Pteridospermae, they may with safety be considered to also characterize some of those members of the Filicales from which the Pteridospermae took their rise. While I would not press the existing terminology of the Filicales too closely upon the generalized forms of the Paleozoic any more than I would consider the mammal *Phenacodus* a horse or a cow, still in our endeavor to get away from a too rigid terminology we are in danger of going too far in the opposite direction, and while it may perhaps be well to set the early Filicales apart under an ordinal name, that of Primofilices (personally I would prefer Eofilicales), it savors somewhat of Saporta's Pro-Gymnospermae. Mr. Arber, however, seems to limit the proposed term to the Leptosporangiatae Paleozoic ferns or their immediate ancestors so that the group might equally well be termed the Primo-Leptosporangiatae, in fact his diagram (*Ann. of Botany*, fig. 1) shows that he 'does not consider the evidence for the existence of the Eusporangiatae entirely satisfactory' until we come down to so comparatively recent a period as the Tertiary. The writer feels very strongly that the future will show this view to be a reactionary one. Personally I place more reliance on the resemblance of the 'frond genera' *Tæniopteris*, *Danæopsis*, etc., to modern forms, especially as the fructifications are known in several instances, than I do upon the suggestion that these latter may be the sporangiatae organs of the Bennettiteæ the descendants of the Paleo-

zoic Pteridospermae. This is surely replacing a probability by a possibility, and we are led to wonder if the filicinean standing of the modern Marattiaceæ will be the next point assailed. In this connection it may not be amiss to quote from Wieland's summary in his splendid study of American Fossil Cycads, just published,¹ he says: "Plainly the preceding résumé of the principal characters of the two great cycad groups as combined and showing their descent from Marattiaceous ferns of the Paleozoic, is not merely conclusive, but one of the great cornerstones upon which the conception of evolution can rest secure."

At the risk of being classed as an 'impressionist' I would maintain that impressions lacking the talismanic 'structure' are not without value, and that resemblances to modern forms, while they may sometimes be instances of homoplasy, are far from being 'of absolutely no value.' It should be borne in mind that structures concerned with the vital process of reproducing the plant species, particularly at a time when seed-bearing was being inaugurated, would be far more liable to show homoplastic variations than would the purely vegetative structures. And far from echoing Professor Seward's statement that at the Linnean Society discussion too great stress had been laid on vegetative and too little on reproductive organs, it would seem to me that the reverse has been the true case.

Dr. Scott's discussion, as usual, is admirable and only too brief in the printed report. The novelties which he can always be depended upon to bring before his audience are facts of observation and not subjective. It may not be amiss to repeat his statement that he repudiated entirely the origin of the Araucarieæ or of any of the known Gymnosperms from Lycopods, and this leads us to a brief consideration of the more pretentious paper by Seward and Ford in the *Philosophical Transactions*. As a summary of existing knowledge of the fossil forms which may be or have been referred to the Araucarieæ, and

as a contribution to our knowledge of the relatively little known living forms, this contribution contains much that is valuable, especially under the second head just mentioned.

As a possible illustration of the somewhat biased view-point assumed throughout, the fossil cone scales which have been referred to *Dammara* may be cited. With reference to all of these the authors say—"we fail to recognize any sufficient reason for this comparison." They quote Berry (1903) as seemingly concurring in Newberry's doubt regarding their relation to *Dammara*, which doubt they characterize as 'well founded.' This in spite of the fact that Newberry was quoted by me and his view discredited in the same paragraph, while in the next paragraph my suggestion of a further reason for doubting Newberry's view is quoted by the authors in another part of their paper (p. 380) as casting doubt upon Hollick's determination of Araucarian foliage from Cliffwood, N. J. While the facts are matters of no very vital importance in this connection, I may state that I have recently collected an undoubted Araucarian cone of large size from the New Jersey Cretaceous and foliage similar to *Araucarites ovatus* Hollick from the Cretaceous of North Carolina, and that I do not entertain the slightest doubt of their Araucarian affinities. Furthermore, in reference to *Dammara* in a paper published in 1904,² a copy of which was mailed to Professor Seward, I state that additional material had led me to remove the interrogation mark which Hollick had placed after the generic name in *Dammara Cliffwoodensis*. These details are only mentioned in this place to show the misconceptions, presumably present in other cases, arising from a misquotation of various authors. Happily Hollick and Jeffrey have recently shown³ that the relationship of the *Dammara* scales, founded as it was upon external resemblance, is amply proven by the anatomical structure, although it must be confessed that this contribution does not seem to have greatly impressed the English authors if we may judge from their summation of its contents.

¹ Carnegie Institution of Washington, Publ. No. 34, August, 1906, p. 240.

² *Bull. Torrey Club*, Vol. XXXI., p. 69.

³ *Amer. Nat.*, Vol. XL., No. 471, March, 1906.

When we come to consider the theoretical conclusions which Seward and Ford feel called upon to bring forward relative to the Lycopodian ancestry of the Araucarieæ, which conclusions are evidently those of the senior author, we cannot assent to any of them, and while it is expressly stated that they do not include the other Coniferales—the Araucarieæ standing far removed from them, it is impossible to understand, as has been already pointed out by Dr. Scott, how the Araucarieæ can be disassociated from their present position in the order Coniferales, which is an eminently natural group as it stands.

In conclusion to refer briefly to Professor Oliver's address on 'The Seed, a Chapter in Evolution,' it may be said that it is a delightful sketch of the possible origin of the seed-habit, couched in a popular style and full of pertinent and suggestive points.

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BOTANICAL NOTES

THE COLLECTION AND STUDY OF VEGETABLE GALLS

BOTANISTS should not neglect the collection of vegetable galls of all kinds, whether caused by plant or animal parasites, since in either case the galls themselves are plant growths. These galls have been studied for some time by Dr. Mel. T. Cook, now of the New York Botanical Garden, Bronx Park, New York City, and he now asks all collectors to aid him in securing as many specimens as possible for his use. He asks that collectors bear the following suggestions in mind.

1. Many species of hard, woody galls should be dried and kept in boxes.

2. Most species of leaf galls should be dried in the same manner as herbarium specimens, except that the weights used should usually be much less—only sufficient to keep them straight.

3. Succulent species which lose their characteristic form in drying should be preserved in alcohol or formalin.

4. The host plant should be determined, or sufficient material sent to permit satisfactory determination.

5. The species should be wrapped separately in paper, or preferably in 'cheese cloth' so that any insects which mature in transit may be kept with their respective galls.

6. While galls produced by both insects and fungi are desired, it should be remembered that Dr. Cook is making a special study of the *galls* rather than the insects or the fungi. The work is strictly botanical, and he, therefore, appeals to botanists to aid him.

7. When the specimens are ready send them to Dr. Cook, at the address given above, accompanying them with an explanatory letter.

MORE PHILIPPINE BOTANY

THE closing number (December) of the *Philippine Journal of Science* contains two articles of botanical interest, viz.:—'The Physiologically Active Constituents of Certain Philippine Medicinal Plants,' by R. F. Bacon, and 'Philippine Fibers and Fibrous Substances,' by G. F. Richmond. The latter is illustrated by several plates. During the year there have been printed in this publication eight botanical papers, and if we add those printed in the five supplements, the number is brought up to nineteen. These supplements, which have been wholly botanical, make a good-sized volume of themselves, covering about 400 pages. Added to the 1,100 pages of the *Journal* proper, the total result is about 1,500 pages of scientific matter for the year. As previously announced, the *Journal* will be divided hereafter, so that the botanical papers will constitute a series by themselves.

In the closing number of the 'Supplement' series E. D. Merrill contributes an interesting paper entitled 'An Enumeration of Philippine Gramineae, with keys to Genera and Species,' covering eighty-six pages, and including notices of seventy-two genera and 226 species and varieties. The paper is almost wholly based on material collected since the American occupation of the islands, and all species not verified by actual specimens are referred to the lists of 'doubtful or excluded' species, which are appended to the genera or tribes. Hackel's well-known monograph is followed rather closely in arrangement and nomenclature.